

Appendix 2 : Laboratory reference values

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Immunoglobulin levels (age-related reference ranges; see Chapter 93)

Age of healthy donors	IgG g/L	IgG ₁ g/L	IgG ₂ g/L	IgG ₃ g/L	IgG ₄ g/L	IgA g/L	IgA ₁ g/L	IgA ₂ g/L	IgM g/L
0– <5 months	1.0–1.34	0.56–2.15	≤0.82	0.07–8.23	≤0.198	0.07–0.37	0.10–0.34	0.004–0.055	0.26–1.22
5– <9 months	1.64–5.88	1.02–3.69	≤0.89	0.119–0.740	≤0.208	0.16–0.50	0.14–0.41	0.015–0.062	0.32–1.32
9– <15 months	2.46–9.04	1.60–5.62	0.24–0.98	0.173–0.637	≤0.220	0.27–0.66	0.20–0.50	0.028–0.070	0.40–1.43
15– <24 months	3.13–11.70	2.09–7.24	0.35–1.05	0.219–0.550	≤0.230	0.36–0.79	0.24–0.58	0.039–0.077	0.46–1.52
2– <4 years	2.95–11.56	1.58–7.21	0.39–1.76	0.170–0.847	0.004–0.491	0.27–2.46	0.16–1.62	0.013–0.311	0.37–1.84
4– <7 years	3.86–14.70	2.09–9.02	0.44–3.16	0.108–0.949	0.008–0.819	0.29–2.56	0.17–1.87	0.011–0.391	0.37–2.24
7– <10 years	4.62–16.82	2.53–10.19	0.54–4.35	0.085–10.26	0.010–1.087	0.34–2.74	0.21–2.21	0.014–0.480	0.38–2.51
10– <13 years	5.03–15.80	2.80–10.30	0.66–5.02	0.115–10.53	0.010–1.219	0.42–2.95	0.27–2.50	0.026–0.534	0.41–2.55
13– <16 years	5.09–15.80	2.89–9.34	0.82–5.16	0.200–10.32	0.007–1.217	0.52–3.19	0.36–2.75	0.047–0.551	0.45–2.44
16– <18 years	4.87–13.27	2.83–7.72	0.98–4.86	0.313–0.976	0.003–1.110	0.60–3.37	0.44–2.89	0.066–0.543	0.49–2.01
≥18 years	7.67–15.90	3.41–8.94	1.71–6.32	0.184–10.60	0.024–1.210	0.61–3.56	0.50–3.14	0.097–1.560	0.37–2.86

Immunoglobulin levels were assessed in serum by nephelometry and data were statistically analyzed for the mid-95% confidence interval. For total IgG and IgG subclass quantitation, data from 156 pediatric and 92 adult donors; for total IgA quantitation, data from 201 pediatric and 99 adult donors; for IgA subclasses, data from 119 pediatric and 99 adult donors; for IgM quantitation, data from 212 pediatric and 401 adults was used at Mayo Medical Laboratories.

Total serum IgE (IU/mL)

Age	Gender	Geometric mean	Upper 95% confidence limit
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Age	Gender	Geometric mean	Upper 95% confidence limit
6–14 years	M	42.7	527
	F	43.3	344
15–24 years	M	33.6	447
	F	18.6	262
25–34 years	M	16.8	275
	F	16.6	216
35–44 years	M	21.7	242
	F	19.3	206
45–54 years	M	19.2	254
	F	13.3	177
55–64 years	M	21.3	354
	F	11.7	148
65–74 years	M	21.2	248
	F	11.5	122
>75 years	M	18.4	219
	F	9.2	124
6–75 years	all M	22.9	317
	all F	14.7	189

From Barbee RA, et al. *J Allergy Clin Immunol* 1981; 68: 106, with permission.

Data generated using skin-prick test-negative (i.e., house dust mite, Bermuda grass, tree mix, weed mix, mold mix) individuals.

Lymphocyte immunophenotype: adult reference range (95% confidence interval)

Surface antigens	Percent positive	Cells/mm ³
T cells		
CD3	57–86	650–2108
CD5	56–84	638–2099
CD2	76–93	876–2258
CD3/CD4	29–57	358–1259
CD3/CD8	13–47	194–836
CD4/CD45RO	12–34	203–976
CD4/CD45RA	2.5–25	31–533
CD8/CD45RO	3–14	34–309
CD8/CD45RA	7–28	101–636
CD3/CD8/CD28	9.5–23	155–441
CD3/CD8/CD57	≤16	≤239
CD3/HLA–DR	≤15.1	≤291
CD3/CD25	≤37.4	≤756
B cells		
CD19	3.5–15.5	49–424
CD20	3.5–17	47–409
CD20/CD5	1.5–8.5	13–145
CD20/CD23	1.6–13.2	38–360
CD20/CD27	0.7–6.3	16–118
NK cells		
CD3–/CD16+CD56+	4.5–30	87–505
Lymphocytes	17–41	1173–2640

Data generated in the Flow Cytometry Section, Immunology Service, DLM, CC, NIH, Bethesda, MD. The 95% confidence interval for the WBC is 4300–9200/mm³.

Age-dependent lymphocyte immunophenotype reference range (80% confidence interval)

Age	T cells					
	CD3	CD4	CD8			
	Percent positive	Cells/mm ³	Percent positive	Cells/mm ³	Percent positive	Cells/mm ³
0–3 mo	53–84	2500–5500	35–64	1600–4000	12–28	560–1700
3–6 mo	51–77	2500–5600	35–56	1800–4000	12–23	590–1600
6–12 mo	49–76	1900–5900	31–56	1400–4300	12–24	500–1700
1–2 yr	53–75	2100–6200	32–51	1300–4300	14–30	620–2000
2–6 yr	56–75	1400–3700	28–47	700–2200	16–30	490–1300
6–12 yr	60–76	1200–2600	31–47	650–1500	18–35	370–1100
12–18 yr	56–84	1000–2200	31–52	530–1300	18–35	330–920
Age	CD4 T-cell subpopulations					
	CD4/CD45RA	CD3/CD4/CD45RO	CD4/HLA-DR			
	Percent CD4 positive	Cells/mm ³	Percent CD3/CD4 positive	Cells/mm ³	Percent CD4 positive	Cells/mm ³
0–3 mo	64–95	1200–3700	2–22	60–900	2–6	40–180
3–6 mo	77–94	1300–3700	3–16	120–630	2–10	60–280
6–12 mo	64–93	1100–3700	5–18	160–800	2–11	50–260
1–2 yr	63–91	1000–2900	7–20	210–850	2–11	70–280
2–6 yr	53–86	430–1500	9–26	220–660	3–12	50–180
6–12 yr	46–77	320–1000	13–30	230–630	3–13	40–120
12–18 yr	33–66	230–770	18–38	240–700	4–11	30–100
Age	CD8 T-cell subpopulations					
	CD8/CD45RA	CD3/CD4/CD45RO	CD8/HLA-DR			
	Percent CD8 positive	Cells/mm ³	Percent CD3/CD4-positive	Cells/mm ³	Percent CD8 positive	Cells/mm ³
0–3 mo	80–99	450–1500	1–9	30–330	2–20	20–160

Age	CD8 T-cell subpopulations					
	CD8/CD45RA	CD3/CD4–/CD45RO	CD8/HLA–DR			
	Percent CD8 positive	Cells/mm ³	Percent CD3/CD4–positive	Cells/mm ³	Percent CD8 positive	Cells/mm ³
3–6 mo	85–98	550–1400	1–7	30–290	3–17	30–170
6–12 mo	75–97	480–1500	1–8	40–330	4–27	40–290
1–2 yr	71–98	490–1700	2–12	60–570	6–33	60–600
2–6 yr	69–97	380–1100	4–16	90–440	7–37	70–420
6–12 yr	63–92	310–900	4–21	70–390	6–29	40–270
12–18 yr	61–91	240–710	4–23	60–310	5–25	30–180
Age	B cells and NK cells					
	CD19	CD3–/CD16–56+				
	Percent positive	Cells/mm ³	Percent positive	Cells/mm ³		
0–3 mo	6–32	300–2000	4–18	170–1100		
3–6 mo	11–41	430–3000	3–14	170–830		
6–12 mo	14–37	610–2600	3–15	160–950		
1–2 yr	16–35	720–2600	3–15	180–920		
2–6 yr	14–33	390–1400	4–17	130–720		
6–12 yr	13–27	270–860	4–17	100–480		
12–18 yr	6–23	110–570	3–22	70–480		

Data generated by Shearer WT, et al. *J Allergy Clin Immunol* 2003; 112: 973–980.

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